

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the Application.

Listing of Claims:

1. **(Previously Presented)** An electromagnetic wave vibrometer apparatus comprising:
 - a signal generator for generating an electromagnetic signal;
 - an amplitude modulator for amplitude modulating the electromagnetic signal to produce an amplitude modulated signal;
 - a transmitter for transmitting the amplitude modulated signal at a vibrating object;
 - a receiver for receiving a reflected amplitude modulated signal from the vibrating object;
 - a demodulator for demodulating the reflected amplitude modulated signal to produce a demodulated signal; and
 - a signal processor for extracting and analyzing a vibration waveform from the demodulated signal.

2. **(Currently Amended)** The apparatus of claim 1 wherein the electromagnetic signal is an optical signal.

3. **(Original)** The apparatus of claim 2 wherein the optical signal is amplitude modulated with a microwave frequency signal.
4. **(Currently Amended)** The apparatus of claim 1 wherein the electromagnetic signal is a microwave signal.
5. **(Currently Amended)** The apparatus of claim 1 wherein the electromagnetic signal is a combination of optical and microwave signals.
6. **(Previously Presented)** The apparatus of claim 5 wherein the optical and microwave signals are modulated at the same frequency.
7. **(Original)** The apparatus of claim 1 further comprising a laser signal source.
8. **(Original)** The apparatus of claim 1 further comprising an LED signal source.
9. **(Original)** The apparatus of claim 1 further comprising a second vibration receiver mounted with the first receiver for compensation of unwanted background or coupled vibration.

10. **(Previously Presented)** The apparatus of claim 9 further comprising a second vibration transmitter mounted with the first receiver for calibration of the apparatus and to determine an angle of reflection.

11. **(Currently Amended)** An apparatus for remotely measuring properties of an object comprising:

- a signal generator for generating an electromagnetic signal;
- an amplitude modulator for amplitude modulating the electromagnetic signal with a modulating signal to produce an amplitude modulated signal;
- a transmitter for transmitting the amplitude modulated signal at an object;
- means for vibrating the object to modulate the amplitude modulated signal transmitted at the object;
- a receiver for receiving a reflected amplitude modulated signal from the object;
- a demodulator for demodulating the reflected amplitude modulated signal using the modulating signal to produce a demodulated signal; and
- a signal processor for extracting and analyzing a vibration waveform from the demodulated signal.

12. **(Currently Amended)** The apparatus of claim 11 wherein the electromagnetic signal is an optical signal.

13. **(Original)** The apparatus of claim 12 wherein the optical signal is amplitude modulated with a microwave frequency signal.
14. **(Currently Amended)** The apparatus of claim 11 wherein the electromagnetic signal is a microwave signal.
15. **(Currently Amended)** The apparatus of claim 11 wherein the electromagnetic signal is a combination of optical and microwave signals.
16. **(Previously Presented)** The apparatus of claim 15 wherein the optical and microwave signals are modulated at the same frequency.
17. **(Original)** The apparatus of claim 11 further comprising a laser signal source.
18. **(Original)** The apparatus of claim 11 further comprising an LED signal source.
19. **(Original)** The apparatus of claim 11 further comprising a second vibration receiver mounted with the first receiver for compensation for unwanted background or coupled vibration.

20. **(Previously Presented)** The apparatus of claim 19 further comprising a second vibration transmitter mounted with the first receiver for calibration of the apparatus and to determine an angle of reflection.

21. **(Currently Amended)** A method of remotely measuring vibration comprising:
generating an electromagnetic signal;
amplitude modulating the electromagnetic signal with an amplitude modulating signal to produce an amplitude modulated signal;
transmitting the amplitude modulated signal at a vibrating object;
receiving a reflected amplitude modulated signal from the vibrating object;
demodulating the reflected amplitude modulated signal using the amplitude modulating signal to produce a demodulated signal; and
analyzing the demodulated signal.

22. **(Currently Amended)** The method of claim 21 wherein the electromagnetic signal is an optical signal.

23. **(Cancelled)**

24. **(Currently Amended)** The method of claim 21 wherein the electromagnetic signal comprises a microwave signal.

25. **(Currently Amended)** The method of claim 21 wherein the electromagnetic signal comprises a combination of microwave and optical signals.

26. **(Previously Presented)** The method of claim 25 wherein the optical and microwave signals are modulated at the same frequency.

27. **(Currently Amended)** The method of claim 21 wherein the electromagnetic signal is generated by a laser or a laser diode.

28. **(Currently Amended)** The method of claim 21 wherein the electromagnetic signal is generated by an LED.

29. **(Original)** The method of claim 21 further comprising compensating for vibration errors by determining displacements of the transmitter and receiver.

30. **(Original)** The method of claim 29 further comprising providing a second vibration receiver mounted with the first receiver for compensating for unwanted background or coupled vibration.

31. **(Previously Presented)** The method of claim 30 further comprising providing a second vibration transmitter mounted with the first receiver for calibrating the vibrometer and to determine an angle of reflection.

32. **(Currently Amended)** A method for remotely determining properties of an object comprising:

amplitude modulating an electromagnetic signal with an amplitude modulating signal to produce an amplitude modulated signal;

transmitting the amplitude modulated signal at an object;

vibrating the object;

receiving reflected amplitude modulated signals from the vibrating object using a first receiver;

compensating for unwanted vibration using a second receiver mounted with the first receiver; and

processing the reflected amplitude modulated signals to extract information about the properties of the object.

33. **(Currently Amended)** The method of claim 32 wherein the electromagnetic signal is an optical signal.

34. **(Cancelled)**

35. **(Currently Amended)** The method of claim 32 wherein the electromagnetic signal comprises a microwave signal.

36. **(Currently Amended)** The method of claim 32 wherein the electromagnetic signal comprises a combination of microwave and optical signals.

37. **(Previously Presented)** The apparatus of claim 32 wherein the optical and microwave signals are modulated at the same frequency.

38. **(Currently Amended)** The method of claim 32 wherein the electromagnetic signal is generated by a laser or a laser diode.

39. **(Currently Amended)** The method of claim 32 wherein the electromagnetic signal is generated by an LED.

40. **(Currently Amended)** The method of claim 32 wherein the generated electromagnetic signal is split into first and second signals and the second signal is transmitted to a demodulator for comparing the second signal with the reflected-amplitude modulated signals.

41. **(Cancelled)**

42. **(Cancelled)**

43. **(Currently Amended)** The method of claim 42 32 further comprising providing a second vibration transmitter mounted with the first receiver for calibrating the vibrometer and to determine an angle of reflection.

44. **(Previously Presented)** The method of claim 1, wherein the amplitude modulated signal is modulated in the GHz range.

45. **(Previously Presented)** The method of claim 11, wherein the amplitude modulated signal is modulated in the GHz range.

46. **(Previously Presented)** The method of claim 21, wherein the amplitude modulated signal is modulated in the GHz range.

47. **(Previously Presented)** The method of claim 32, wherein the amplitude modulated signal is modulated in the GHz range.

48. **(New)** A method of remotely measuring vibration, comprising:
- providing a non-coherent beam of light;
 - amplitude modulating the non-coherent beam of light with an amplitude modulating signal to produce an amplitude modulated beam of light;
 - transmitting the amplitude modulated beam of light at a vibrating object;
 - receiving a reflected amplitude modulated beam of light from the vibrating object using a receiver;
 - demodulating the reflected amplitude modulated beam of light using the amplitude modulating signal to extract vibration information from the amplitude modulated signal.
49. **(New)** The method of claim 48, wherein the non-coherent beam of light is produced by an LED.
50. **(New)** The method of claim 48, wherein the non-coherent beam of light is an optical signal.
51. **(New)** The method of claim 48, further comprising compensating for vibration errors by determining displacements of the transmitter and receiver.

Appln. No. 10/069,696
Amendment Dated: October 4, 2005
Reply to Office Action Mailed May 4, 2005

52. **(New)** The method of claim 51, further comprising compensating for unwanted background or coupled vibration using a second receiver.

53. **(New)** The method of claim 52, further comprising determining an angle of reflection using a second vibration transmitter mounted with the receiver.

54. **(New)** A microwave vibrometer, comprising:
- a signal generator for generating a first microwave frequency signal;
 - a power splitter for splitting the first microwave signal into a reference signal and a signal to be transmitted;
 - a circulator for transmitting the signal to be transmitted at a vibrating object, for receiving a phase modulated reflected signal from the vibrating object, and for decoupling the transmitted signal from the reflected signal;
 - a first mixer for mixing the phase modulated reflected signal with an intermediate frequency signal to produce a first mixed signal;
 - a second mixer for mixing the reference signal with the intermediate frequency signal to produce a second mixed signal;
 - an I & Q demodulator for mixing the first mixed signal and the second mixed signal to produce a demodulated signal; and
 - means for extracting and analyzing a vibration waveform from the demodulated signal.